

Claims:

1. Single-phase, liquid compositions (solutions) comprising
 - at least one organic semiconductor which comprises at least one high-molecular-weight component,
 - and at least one organic solvent A,
 - and at least one organic solvent B,
 - and at least one organic solvent C,characterised in that
 - solvent A is a good solvent for the organic semiconductor,
 - solvent B is a good solvent for the organic semiconductor,
 - solvent C is a poor solvent for the organic semiconductor and
 - the following applies to the boiling points (b.p.) of solvents A, B and C:
 $\text{b.p.}(A) < \text{b.p.}(C) < \text{b.p.}(B)$, and/or to the respective partial vapour pressures (p) at the temperature of the coating methods of solvents A, B and C:
 $p(A) > p(C) > p(B)$.
2. Solutions according to Claim 1, characterised in that the organic semiconductor is soluble in the pure solvent A or in the pure solvent B in a concentration of at least 5 g/l at room temperature.
3. Solutions according to Claims 1 and/or 2, characterised in that the solubility of the organic semiconductor in the pure solvent C at room temperature is less than 0.3 g/l.
4. Solutions according to one or more of Claims 1 to 3, characterised in that the organic semiconductor is employed as pure component.
5. Solutions according to one or more of Claims 1 to 3, characterised in that the organic semiconductor is employed as a mixture of two or more components.
6. Solutions according to Claim 5, characterised in that one or more organic non-conductors are used as matrix.
7. Solutions according to one or more of Claims 1 to 6, characterised in that the high-molecular-weight component has a molecular weight M_w of greater than 50,000 g/mol.

8. Solutions according to one or more of Claims 1 to 7, characterised in that the polymeric organic semiconductors employed are substituted poly-p-arylene-vinylenes (PAVs), polyfluorenes (PFs), polyspirobifluorenes (PSFs), poly-para-phenylenes (PPPs) or -biphenylenes, polydihydrophenanthrenes (PDHPs), cis- and trans-polyindeno[1,2-b]fluorenes (PIFs), polythiophenes (PTs), polypyridines (PPys), copolymers which contain structural units from two or more of the above-mentioned classes, generally conjugated polymers, polyvinylcarbazoles (PVKs), polytriarylamines and/or soluble polymers containing phosphorescent units, which are soluble in organic solvents.
9. Solutions according to one or more of Claims 1 to 8, characterised in that non-conducting polymers (matrix polymers) which comprise low-molecular-weight, oligomeric, dendritic or polymeric organic and/or organometallic semiconductors are used.
10. Solutions according to one or more of Claims 1 to 9, characterised in that the boiling point of all three solvents A, B and C is greater than 120°C.
11. Solutions according to one or more of Claims 1 to 10, characterised in that the boiling point of all three solvents A, B and C is less than 300°C.
12. Solutions according to one or more of Claims 1 to 11, characterised in that the difference between the boiling points of solvent A and solvent C is greater than 10 K.
13. Solutions according to one or more of Claims 1 to 12, characterised in that the difference between the boiling points of solvent C and solvent B is greater than 10 K.
14. Solutions according to one or more of Claims 1 to 13, characterised in that the proportion of solvent A is 10 to 80% by vol., the proportion of solvent B is 0.5 to 40% by vol. and the proportion of solvent C is 10 to 90% by vol.
15. Solutions according to Claim 14, characterised in that the proportion of solvent A is 25 to 60% by vol., the proportion of solvent B is 2 to 20% by vol. and the proportion of solvent C is 30 to 70% by vol.
16. Solutions according to one or more of Claims 1 to 15, characterised in that other good and/or poor solvents are used in addition to solvents A, B and C.

17. Solutions according to one or more of Claims 1 to 16, characterised in that solvents A and/or B used are mono- or polysubstituted aromatic solvents, formic acid derivatives, N-alkylpyrrolidones or high-boiling ethers.

18. Solutions according to Claim 17, characterised in that solvents A and/or B are one or more solvents selected from 3-fluorobenzotrifluoride, benzotrifluoride, dioxane, trifluoromethoxybenzene, 4-fluorobenzotrifluoride, 3-fluoropyridine, toluene, 2-fluorotoluene, 2-fluorobenzotrifluoride, 3-fluorotoluene, pyridine, 4-fluorotoluene, 2,5-difluorotoluene, 1-chloro-2,4-difluorobenzene, 2-fluoropyridine, 3-chlorofluorobenzene, 1-chloro-2,5-difluorobenzene, 4-chlorofluorobenzene, chlorobenzene, 2-chlorofluorobenzene, p-xylene, m-xylene, o-xylene, 2,6-lutidine, 2-fluoro-m-xylene, 3-fluoro-o-xylene, 2-chlorobenzotrifluoride, dimethylformamide, 2-chloro-6-fluorotoluene, 2-fluoroanisole, anisole, 2,3-dimethylpyrazine, bromobenzene, 4-fluoroanisole, 3-fluoroanisole, 3-trifluoromethylanisole, 2-methylanisole, phenetol, benzodioxole, 4-methylanisole, 3-methylanisole, 4-fluoro-3-methylanisole, 1,2-dichlorobenzene, 2-fluorobenzonitrile, 4-fluoroveratrol, 2,6-dimethylanisole, aniline, 3-fluorobenzonitrile, 2,5-dimethylanisole, 2,4-dimethylanisole, benzonitrile, 3,5-dimethylanisole, N,N-dimethylaniline, 1-fluoro-3,5-dimethoxybenzene, phenyl acetate, N-methylaniline, methyl benzoate, N-methylpyrrolidone, 3,4-dimethylanisole, acetophenone, o-tolunitrile, 4-tert-butylanisole, veratrol, ethyl benzoate, N,N-diethylaniline, propyl benzoate, 1-methylnaphthalene, 3,5-dimethoxytoluene, butyl benzoate, 2-methylbiphenyl, dimethylnaphthalene, 2-phenylpyridine or 2,2'-bitolyl.

19. Solutions according to one or more of Claims 1 to 18, characterised in that the solvents C used are straight-chain, branched or cyclic higher alkanes, preferably having seven or more C atoms, terpenes, (cyclo)aliphatic alcohols, ketones, carboxylic acid esters or mono- or polysubstituted aromatic solvents which are substituted by long alkyl or alkoxy substituents having 4 or more C atoms, higher alcohols having more than 4 C atoms, glycols or ethers thereof.

20. Solutions according to Claim 19, characterised in that at least one solvent C is selected from methylcyclohexane, 3-pentanol, 1,4-dimethylcyclohexane, ethylene glycol monomethyl ether, 1,2-dimethylcyclohexane, octane, 2-hexanol, 1-pentanol, 1,2,4-trimethylcyclohexane, 4-heptanone, 3-heptanone, 2-heptanone, nonane, cyclohexanone, 3-heptanol, 1-hexanol, 2-heptanol, diglyme, butyl butyrate, tert-butylbenzene, decane, 1-heptanol, 2-octanol, butylcyclohexane, 2-ethyl-1-hexanol, decalin, propylene glycol, dimethyl sulfoxide, 3,3,5-trimethyl-

cyclohexanone, glycol, 3,7-dimethyl-1-octanol, 3,7-dimethyl-3-octanol, dimethyl succinate, tert-butyl-m-xylene, benzyl alcohol, DBE, dodecane, diethyl succinate, triglyme, bicyclohexyl, dimethyl adipate, 1-decanol or 2-pyrrolidone.

- 5 21. Use of solutions according to one or more of Claims 1 to 20 for the production of layers of the organic semiconductors on a substrate.
- 10 22. Process for the production of organic semiconductor layers on a substrate, characterised in that a solution according to one or more of Claims 1 to 20 is processed by means of a printing method.
23. Process according to Claim 22, characterised in that the printing method is an ink-jet printing (IJP) method.
- 15 24. Layers of organic semiconductors, characterised in that they are produced using a solution according to one or more of Claims 1 to 20 or by means of a printing method according to Claim 22 and/or 23.
- 20 25. Polymeric light-emitting diodes (PLEDs), organic field-effect transistors (O-FETs), organic thin-film transistors (O-TFTs), organic integrated circuits (O-ICs), organic solar cells (O-SCs) or organic laser diodes (O-lasers) comprising at least one layer according to Claim 24.